ABSTRACT

INTRODUCTION:

Rapid evolution of CAD/CAM technology (Computer Aided Design, Computer Aided Manufacture) shows dramatic impact on all disciplines of dentistry especially in the fields of prosthodontics. There has been a concomitant increase in demand over the past 25 years. The integration of these technological systems with advances in biomaterials, can be applied to fabricate inlays, onlays, veneers, crowns, fixed partial dentures, implant abutments and even full-mouth reconstruction. Recently, several aspects of CAD/CAM systems have had significant technological improvements, these include the development and application of newer materials in the field of dentistry

Among those materials Polyetheretherketone (PEEK) and zirconia shows excellent resistance to chemical , thermal , post-irradiation degradation low solubility and water absorption due to its structure ,when it is compared with other currently available esthetic computer-aided-design/computer-aided-manufacturing (CAD/CAM) polymers. The weakest link in the fixed partial denture treatment is the tooth-restorative margin interface. The longterm success of any fixed partial denture is the good marginal and internal fit. Improper fit may cause dissolution of cement, percolation of fluid leading to secondary caries. The advancement of CAD CAM technology (Computer Aided Design, Computer Aided Manufacture) using optical scanning and computerized processing produces an excellent fit and adaptation.

Here, the purpose of the present study is to evaluate the marginal fit and internal adaptation of Polyetheretherketone (PEEK) and Zirconia copings.

AIMS AND OBJECTIVES:

1. Determine the Marginal fit and Internal adaptaion of copings fabricated with polyetheretherketone (PEEK)
2. Determine the Marginal fit and Internal adaptaion of copings fabricated with Zirconia
3. Comparison of Marginal fit and Internaladaptaion of.
   - copings fabricated with Polyetheretherketone (PEEK) luted with resin cements
   - copings fabricated with Zirconia luted with resin cements.

METHODOLOGY:

In the present study,an in vitro study was planned to check both the marginal fit and internal adaptation in acrylic models for that maxillary first premolar was prepared. The selected tooth was prepared for all ceramic crowns with ideal dimension. The preparation depths were 1mm axially and 2mm occlusally. The shoulder finish line margins were supra-gingival and the tooth preparation had a convergence angle of six degrees.

Using addition silicone putty (AQUASIL), an impression of prepared maxillary first premolar was made and wax tooth model was fabricated from the impression. The wax tooth model was invested and casted to fabricate cobalt – chromium metal tooth model.

The cobalt – chromium tooth model is duplicated using additional silicone to fabricate 30 heat cure acrylic models. The samples were divided into two groups. Each group consist of fifteen copings (15 PEEK & 15 Zirconia).

A self cure resin luting agent was used to cement the Polyetheretherketone (PEEK) & Zirconia copings to each model. An equal length of the luting resin is dispensed on the mixing pad, was done according to the manufacturer instructions, the mixed cement was painted on the internal surfaces of the copings.

Copings were luted on the prepared tooth model with finger pressure for 10 minutes and the excess cements from the margins are removed. Sagittal cross section of the sample has been made using a Diamond wheel disc, having a disc thickness of 0.01mm cutting at high speed using a Tooth cutting lathe for all the 30 samples . To prevent heat production entire sectioning procedure was carried out with continuous irrigation from the three way syringe .Values were recorded under a Field Emission Scanning electron microscope 1000X magnification .

RESULTS

In the present study marginal fit and internal adaptation measured as values, among those two groups Polyetheretherketone (PEEK) copings group materials showed the lowest mean value of (30.3±5.1) for marginal gap, (29.1±5.8) for internal gap whereas zirconia copings group showed a mean value of (50.26±16.02) and (32.8±5.2)respectively. These results were statistically analyzed using ANOVA (Post hoc) followed by Dunnett ‘t’ test applied .

SUMMARY AND CONCLUSION

Although it was proved that excellent marginal fit and internal adaptaion compared with zirconia coping. However, the numerical values presented for the marginal and internal adaptation of polyetheretherketone (PEEK) and zirconia coping are both clinically acceptable. Marginal fit and internal adaptation important factors in increasing the longevity of the restoration. The future research on Field Emission Scanning Electron Microscopy can be done on these variables to get the better results.